

Impact of Security Requirements on the Properties of Big Data in the Context of Secure Data Transfer

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Agenda

- Introduction
- Big Picture
- CIA Triad properties in an industrial context
- Big Data properties
- Future work

Introduction

- Expansion of ICT integration into manufacturing/production process and 'in-use' stage of a product lifecycle
- Data allows to diminish the delay of feedback from the production and usage behaviour
 - ... and creates possibilities for new applications, products and services
- As the amount of data is growing, efficient handling of data becomes critical.
- Aggregation of data is one important step
 - industrial equipment/products in the field
 - secure data transfer



What would be a model, which could describe how to balance big data and security requirements to get an optimal trade-off?

Big picture

New products and services

Applications, Visual analytics, Decision support, Alerting, Monitoring, Reporting etc.

Machine learning, Data mining, Data analytics, Recommender system business logic, Decision support business logic, Simulations, Scheduling/planning support business logic etc.

Data aggregation, ETL, data warehouse, cloud services

Data storage

ERP

CRM

R&D/KB

Contracts

QC

Public data

Process adjustments, automatic error detection/correction

Device 1

time: 21654897
temperature: 1450
magnetic-particle-count: 97

Device 2

time: 4435897
weld-time: 340
x-ray-reading: 76
acoustics: 4.2365

Device 3

time: 543819524
sealing-factor: 52
cooldown-time: 2.574
voltage-meas: 2.384

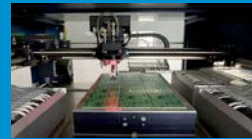
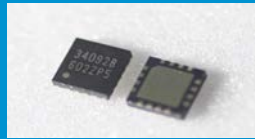
Device 4

time: 74562159
meas-1: 52
meas-2: 2.574
meas-3: 2.384

Device 5

time: 74562159
working-hours: 525.2
usage-coef: 312.68
shaft-deviation: 0.01

Device n



Secure data collection/transfer

Big picture

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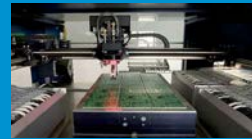
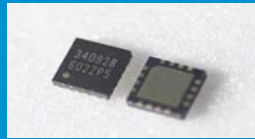
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temperature: 1450
magnetic-particle-count: 97

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weld-time: 340
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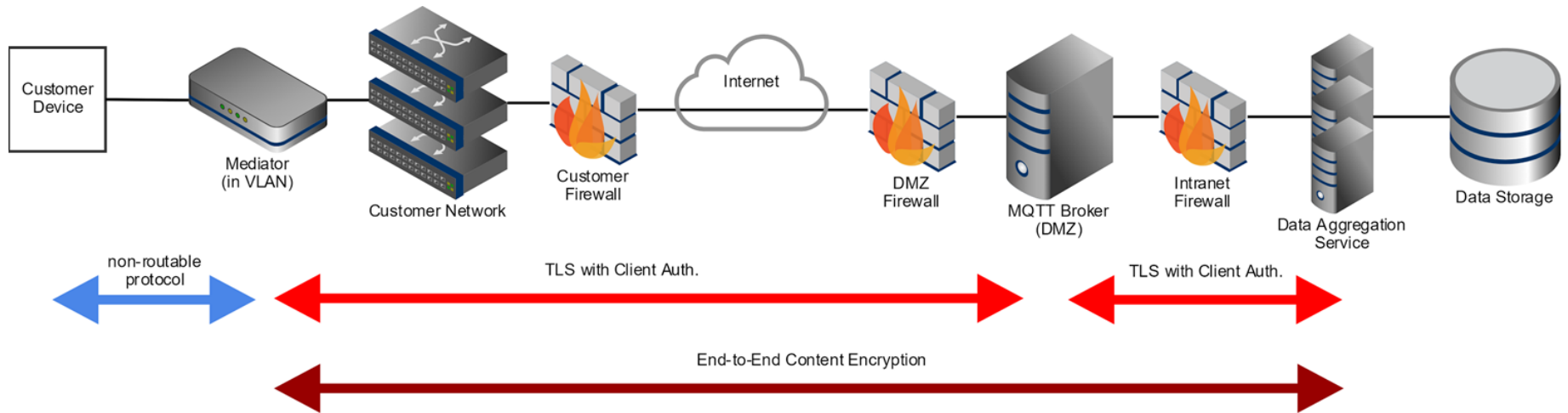
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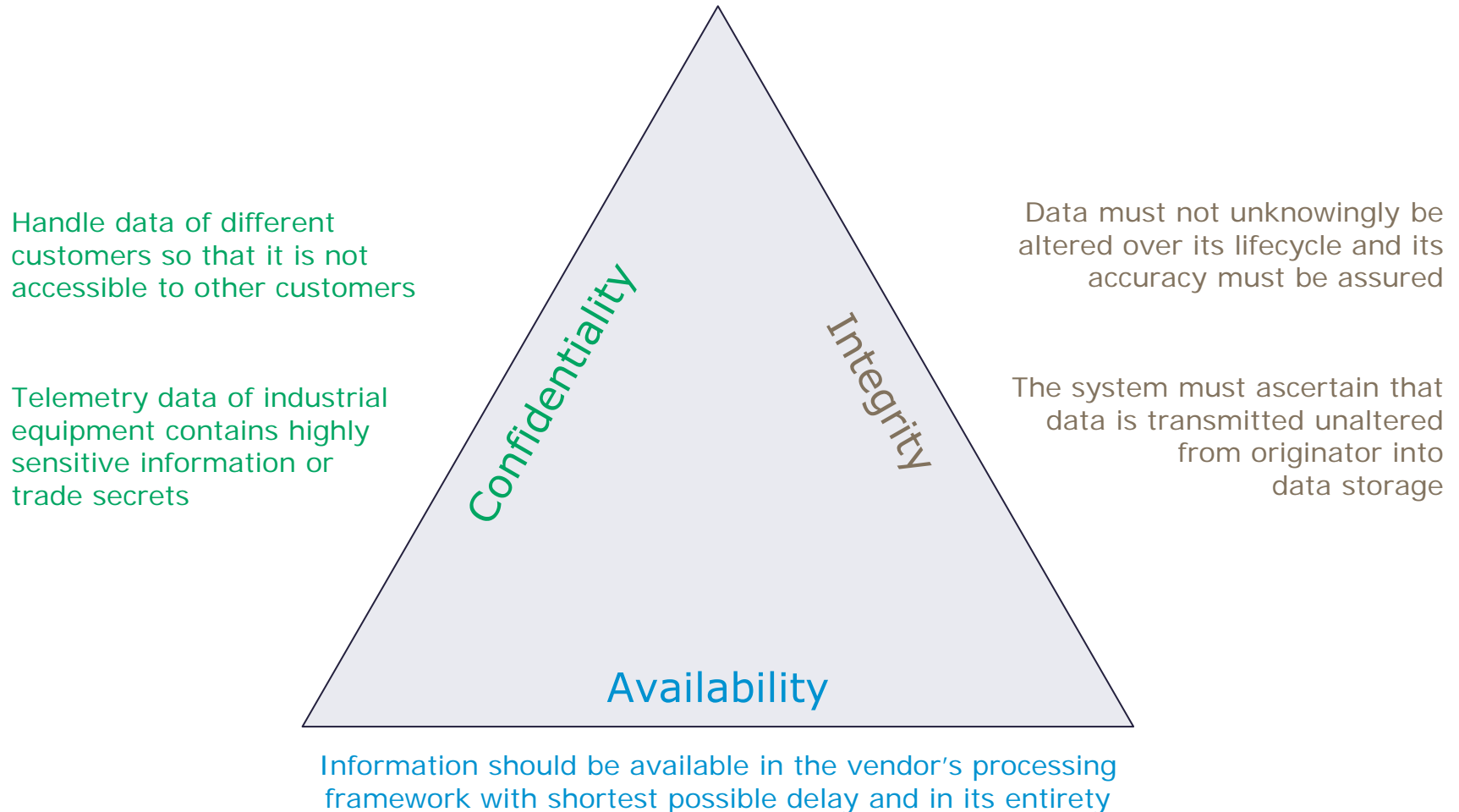
Secure data collection/transfer

Process adjustments, automatic error detection, data contraction

Detailed view



CIA Triad properties in our industrial context



Big Data Properties

- Often defined as 3 or 5 Vs

Volume: size, scale and amount of data being stored
Directly influenced by security requirements and other big data properties

Velocity: how fast data is generated and put in the data transfer pipeline
streaming data, real-time data, batch data transfer etc.
large impact of security requirements

Variety: complexity and semantic models behind this data
influences data storage infrastructure and data modeling
Message Queue Telemetry Transport → structure-agnostic data transmission pipeline

Veracity: data consistency (or certainty), which can be defined by their statistical reliability, and data trustworthiness

Value: added value that data generates
predictability → compression techniques
value for the company → different levels of security

Future work

- The overall goal of our work is to construct a model for finding balance between security requirements and properties of big data.
- Focus of the work in the future:
 - Presentation of state-of-the art analysis of requirement implications of security aspects on big data and vice versa.
 - Proposed model of operationalizing the CIA-triad in an industrial context and balancing these parameters with big data requirements and characteristics (5 Vs).
 - Creating generally applicable model that can be used to find optimal satisfactory level of security and big data properties.
 - Application of the model to a selected use case from the automotive industry, discussion of preliminary results.

Thank you for your attention!



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